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NANOSYS INC. 2625 HANOVER ST. PALO ALTO, CA 94304			EXAMINER NEGIN, RUSSELL SCOTT	
			ART UNIT 1631	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patents@nanosysinc.com

### Office Action Summary

**Application No.**

10/826,153

**Applicant(s)**

SCHER ET AL.

**Examiner**

RUSSELL S. NEGIN

**Art Unit**

1631

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 April 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 26-37, 40-42, 44, 45, 47, 48 and 60-69 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 26-37, 40-42, 44, 45, 47, 48 and 60-69 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 4/26/10
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Comments***

Applicant's amendments and request for reconsideration in the communication filed on 26 April 2010 are acknowledged and the amendments are entered.

Claims 26-37, 40-42, 44-45, 47-48, and 60-69 are pending and examined in this Office action.

### ***Withdrawn Rejections***

The rejections of claims 26-37, 41-42, 44-45, 47-48, and 60-68 under 35 U.S.C. 103(a) as being unpatentable over Han et al. [Nature Biotechnology, July 2001, volume 19, pages 631-635] in view of Kagan et al. [Physical Review Letters, 1996, volume 76, pages 1517-1520] in view of Takagahara [Surface Science, 1992, volume 267, pages 310-314] are withdrawn in view of arguments on pages 8-10 of the Remarks.

The rejection of claim 69 under 35 U.S.C. 103(a) as being unpatentable over Han et al. as applied above, in further view of Chen et al. [Physical Review B, volume 64, 2001, pages 245304-1 to 245304-4] is withdrawn in view of arguments on pages 10-11 of the Remarks.

The rejection of claim 40 under 35 U.S.C. 103(a) as being unpatentable over Han et al. in view of Kagan et al. in view of Takagahara as applied above, in further view of Bruchez et al. [US Patent 6,274,323 B1; issued 14 August 2001; filed 5 May 2000] is withdrawn in view of arguments on page 11 of the Remarks.

***Information Disclosure Statement***

The Information disclosure statement filed on 26 April 2010 has been considered.

***Priority***

This application claims benefit to provisional application 60/463,765 filed on 17 April 2003. With regard to claim 69, there is no support for the amendment requiring "predetermined variations in at least one emission property of the population CORRESPONDING TO multiple predetermined excitation polarization angles." The closest support in the provisional application is in lines 18-24 of page 18 of '765. Specifically, lines 18-24 of page 18 of the provisional application discloses predetermined selection of excitation angles to result in unique combinations of the emission property of emission polarization angles [lines 20-24 of page 18 of '765]. However, while lines 18-24 of page 18 of the provisional application discloses that variations of the excitation angles are predetermined, lines 18-24 of page 18 of the provisional application does not disclose that the resulting variations of the emission properties (in this instance, emission polarization angles) are also PREDETERMINED. In other words, as a result of the predetermined excitation polarization angle, emission properties result with a variation, but this variation is only determined after the fact. Consequently, the benefit date of the instant claim 69 is the instant filing date of 16 April 2004 and NOT 17 April 2003.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following rejections are NEWLY applied:

**WRITTEN DESCRIPTION**

Claims 26-37, 40-42, 44-45, 47-48, 60-66, and 69 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Independent claim 26 recites the limitation that requires interaction between two or more different subsets of nanocrystals (i.e. see lines 6-9 of claim 26). Paragraph 41 of the specification discloses that there exist combinations of nanocrystals with distinct emissions properties. Paragraph 19 of the specification goes as far as to teach that this plurality of distinct subsets of nanocrystals may exhibit different emissions profiles when excited alternately by different wavelengths of light. However, paragraph 19 does not teach that the subsets of nanocrystals interact under these conditions. Paragraph 47 discloses the quantum mechanical properties resulting from excitation and emissions specific quantum dots. Figures 1 and 2 of the instant application reflect a linear correspondence of relative abundances of different nanocrystal members in a

nanocrystal mixture (see commentary in paragraphs 73-76). The instant specification is in fact silent with regard to interaction **BETWEEN** nanocrystals. Consequently, while the instant specification provides support for distinct mixtures of nanocrystal particles such that the relative abundances of the subsets of nanocrystals are linearly reflected, as shown in the instant Figures, the instant specification does not provide support for interactions (i.e. cooperativity or any other type of interaction) between the distinct subsets of nanocrystals.

The closest support in the disclosure is taught in paragraph 59, wherein "multiplexed" data can be used in analyzing, encoding, and decoding the resultant data. However, in the passage of Han et al. [Nature Biotechnology, July 2001, volume 19, pages 631-635] cited by applicant on page 9 of the Remarks (i.e. the last full paragraph of page 632 of Han et al.), applicant effectively reiterates the teaching in Han et al. that while the optical coding taught may be multiplexed, there is no requirement for interactions (i.e. FRET) between the subsets of distinct nanocrystals in the mixture. In fact, Han et al. states that there **CANNOT** be interactions between the different subsets of nanocrystals (see enablement rejection below) in order for the multiplexed coding to be properly detected and analyzed.

In view of this lack of support for interactions between different subsets of nanocrystals in the specification (also, paragraphs 13, 40, 48, 53, 70, 75, 99, and 101; as cited by applicant on page 8 of the Remarks of 11 November 2009 for alleged support; are also silent with regard to these interactions), this limitation is considered to encompass **NEW MATTER**.

With regard to amended claim 69, there is no support for the amendment requiring "predetermined variations in at least one emission property of the population CORRESPONDING TO multiple predetermined excitation polarization angles." The closest support is disclosed at the bottom of paragraph 57. Specifically, lines 12-17 of paragraph 57 of the instant application discloses predetermined selection of excitation angles to result in unique combinations of the emission property of emission polarization angles [lines 12-17 of paragraph 57]. However, while lines 12-17 of paragraph 57 of the instant application discloses that variations of the excitation angles are predetermined, lines 12-17 of paragraph 57 of the instant application does not disclose that the resulting variations of the emission properties (in this instance, emission polarization angles) are also PREDETERMINED. In other words, as a result of the predetermined excitation polarization angle, emission properties result with a variation, but this variation is only determined after the fact. Also, paragraphs 10 and 19; as cited by applicant on page 8 of the Remarks of 26 April 2010 for alleged support; are also silent with regard to this second "predetermination." Specifically, lines 4-6 of paragraph 19 state, "The compositions can have populations of nanocrystals with predetermined excitation spectra OR emission spectra." Consequently, the amendments to instant claim 69 constitute NEW MATTER.

The following rejections are NEWLY applied:

ENABLEMENT

Claims 26-37, 40-42, 44-45, 47-48, and 60-66 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, the claims reciting a composition characterized for a unique spectral code is not enabled when the subsets of nanocrystals interact (i.e. cooperatively or in some other manner) with one another.

1. The instant set of rejected claims requires some sort of interaction between distinct subsets of nanocrystals within a single mixture. The claims do not recite how this interaction affects the emissions profile (i.e. the degree of non-linearity resulting from, for instance, a cooperative interaction of two distinct subsets of nanocrystals in a mixture).

2. The specification does not shed light on how these interactions between distinct subsets of nanocrystals occurs. In fact, the written description rejection above explains that the original disclosure lacks support for how the subsets of nanocrystals interact in any means in order to affect the resulting spectral codes.

3. The prior art of Han et al. teaches a linear relation between abundances of different subsets (in Han et al., the colors red, green, and blue nanocrystals) in the nanocrystal mixture and the resulting emissions profile (i.e. see Figure 1A on page 632



of Han et al.). In the Remarks of 26 April 2010, applicant confirms the teaching in the last paragraph on page 632 of Han et al. by reiterating that in multiplexed optical coding, there CANNOT be interactions between the nanocrystal subsets (in this instance, the interaction disclosed in Han et al. is fluorescence resonance energy transfer) [see bold text on page 9 of the Remarks of 26 April 2010].

4. In the absence of interactions between subsets of distinct nanocrystals in a mixture, it is rather straightforward to determine multiplexed optical coding (i.e. see the linear relationship in Figure 1 of Han et al.). However, the instantly rejected claims require some sort of interactions between constituent subsets. In the absence of guidance from the claims or specification on how these interactions quantitatively (or even qualitatively) affect the relationships between the emissions profiles between the subsets of nanocrystals, a linear correspondence between abundance and emission (such as in Figure 1 of Han et al.) may not exist. In the presence of these interactions, one of skill in the art must guess at how the interactions between nanocrystal subsets affect the emissions profiles. Such guessing amounts to UNDUE EXPERIMENTATION.

In view of the above, it is the Examiner's position that with the insufficient guidance and working examples and in view of unpredictability and the state of art one skilled in the art could not make and/or use the invention with the claimed breadth without an undue amount of experimentation.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The following rejection is NEWLY applied:

#### INDEFINITENESS

Claim 68 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "invisible to the naked eye" in claim 68 is a relative term which renders the claim indefinite. The term "invisible to the naked eye" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Since many animals have different types of vision, what is visible to the naked eye of a rabbit may not be visible to the naked eye of a dog. Even within humans, there is a wide variation of vision accuracy. For example, while there are pilots with 20/20 accuracy, there are also blind people whose "naked eyes" are incapable of any vision. For the purpose of examination, it is interpreted that the geometric shape does not emit in the range of 400 to 700 nanometer at least when it is not excited.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following rejection is NEWLY applied:

Claims 67-68 are rejected under 35 U.S.C. 102(b) as being anticipated by Han et al. [Nature Biotechnology, July 2001, volume 19, pages 631-635] in light of Excitation [Definition of Excitation, Market House Books, 2006].

Claim 67 is drawn to a composition for tagging and detecting comprising a population of nanocrystals comprising two or more subsets of nanocrystals that emit light when excited. This population has a unique spectral code wherein the spectral code. The spectral code comprises the emission spectra of the population upon excitation with the one or more excitation wavelengths. The spectral code further comprises one or more geometric shapes formed by the emission wherein the geometric shapes correspond to the configuration of the nanocrystal subset.

Claim 68 is further limiting wherein the geometric shape is not in the visible range when the composition is not excited.

The composition of the instantly rejected claims is most clearly illustrated in Figure 5 on page 634 of Han et al. The top schematic of the figure illustrates a composition comprising a composition of quantum dot nanocrystals (they are illustrated as little circles as part of the larger, solid, microbead). This composition emits light when excited (specifically with a UV lamp as taught in the "Multicolor imaging" section of "Experimental Protocol" on page 635 of Han et al.) resulting in the encoding of a unique optical spectral code (i.e. 1:1:1) for the composition as illustrated in the upper right of

Figure 5 of Han et al. Alternate spectral codes are illustrated for other combinations of nanocrystals (i.e. 1:2:1 and 2:1:1). These plots (i.e. of 1:1:1, 1:2:1, and 2:1:1 ratios) correspond to geometric shapes of Lorentzian/Gaussian-like curves with peak heights corresponding to the degree of the component of the ratio.

While Han et al. does not explicitly state that these spectral codes would not be visible in the absence of excitation wavelengths, it is inherent that excitation is necessary for the visibility of these emission spectra. Specifically, the definition of Excitation demonstrates that the excitation wavelength is what excites the molecule and induces the molecule to release the photons that may be visible in the wavelength range between 400 and 700 nm (i.e. as in the abscissa in the plots of Figure 6 of Han et al.).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The following rejection is NEWLY applied:

Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Han et al. [Nature Biotechnology, July 2001, volume 19, pages 631-635] as applied to claims 67-68 above, in further view of Chung et al. [PNAS, 21 January 2003, volume 100, pages 405-408; on IDS].

Claim 69 is drawn to a composition for tagging and detecting objects. The composition comprises a population of nanocrystals comprising two or more subsets of nanocrystals wherein the population comprises a unique spectral code. This unique spectral code comprises one or more predetermined excitation wavelengths and a corresponding emission profile for the population of nanocrystals. This unique spectral code also comprises one or more predetermined variations in at least one emission property of the population corresponding to multiple predetermined excitation polarization angles.

The article of Han et al. studies quantum-dot (nanocrystal) tagged microbeads for multiplexed optical coding of biomolecules.

As explained above, the composition of the instantly rejected claims is most clearly illustrated in Figure 5 on page 634 of Han et al. The top schematic of the figure illustrates a composition comprising a composition of quantum dot nanocrystals (they

are illustrated as little circles as part of the larger, solid, microbead). This composition emits light when excited (specifically with a UV lamp as taught in the "Multicolor imaging" section of "Experimental Protocol" on page 635 of Han et al.) resulting in the encoding of a unique optical spectral code (i.e. 1:1:1) for the composition as illustrated in the upper right of Figure 5 of Han et al. Alternate spectral codes are illustrated for other combinations of nanocrystals (i.e. 1:2:1 and 2:1:1). Combinations of multiple wavelengths are suggested in the paragraph bridging pages 631-632 of Han et al.

Han et al. does not teach predetermined emissions resulting from a plurality of predetermined polarization angles.

The article of Chung et al. studies polarization microscopy of CdSe [title].

Specifically, the plurality of predetermined polarization angles illustrated in Figure 1A of Chung et al. result in the emissions profiles in Figure 1B and 2 of Chung et al. that are predetermined using the theory of Figure 3 of Chung et al.

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify the nanocrystal composition excited in order to encode for a unique spectra in Han et al. by use of the relations between emissions profiles and excitation polarization angles of Chung et al. because it is obvious to substitute known elements in the prior art to yield a predictable result. In this instance, measuring by angle is an alternate form of assessing optical properties than measurement by wavelength or distance. There would have been a reasonable expectation of success in combining Han et al. and Chung et al. because both studies pertain to use of

excitation wavelengths (that must be inflicted at an angle) to produce emissions spectra in CdSe nanocrystals.

### ***Response to Arguments***

Applicant's arguments with respect to the instantly rejected claims have been considered but are moot in view of the new ground(s) of rejection.

It is noted, however, that the references of Han et al. is reiterated from the previous Office action. With regard to claim 67, applicant argues that Han et al. does not teach a spectral code that comprises geometric shapes formed by the emission of the nanocrystal subset upon excitation. This argument is not persuasive because absent a definition of what a geometric shape comprises, the Lorentzian or Gaussian like curves in Figure 5 of Han et al. are interpreted to be geometric shapes.

### ***Conclusion***

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the central PTO Fax Center. The faxing of such pages must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993)(See 37 CFR § 1.6(d)). The Central PTO Fax Center Number is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell Negin, whose telephone number is (571) 272-1083. The examiner can normally be reached on Monday-Friday from 8:30 am to 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, Marjorie Moran, Supervisory Patent Examiner, can be reached at (571) 272-0720.

Information regarding the status of the application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information on the PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Russell S. Negin/  
Examiner, Art Unit 1631  
17 July 2010